DOCUMENT RESUME

ED 323 785 FL 018 842

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TITLE Lecture Comprehension and Note-Taking for L2 Students.
PUB DATE Apr 90
NOTE 36p.; Paper presented at the World Congress of Applied Linguistics sponsored by the International Association of Applied Linguistics (9th, Thessaloniki, Greece, April 15-21, 1990).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Communication (Thought Transfer); Discourse Analysis; English (Second Language); *English for Academic Purposes; Foreign Countries; Higher Education; Language Research; *Lecture Method; *Listening Comprehension; *Notetaking; *Science Instruction; Second Language Learning
IDENTIFIERS *Oman

ABSTRACT

Most information is still conveyed to university students through lectures. This necessitates that students have sophisticated listening and note-taking skills, and poses additional difficulties for non-native students. To identify areas for improvement, science lectures in English in the Sultanate of Oman were analyzed. The relationship between the lecturers' method of explaining and the students' way of recording information was investigated by examining notes taken on one topic. Analysis of both course handouts and student notes revealed that many students were unaware of lecturers' cues to signal key words, and had difficulty extracting them from ongoing discourse. When students did make an effort to record important points, they used no standard abbreviations nor any form of shorthand. In almost half the cases where independent notes were made, layout was poor and relationships between items of information were not clearly indicated, leaving an incomplete and misleading summary of the lecture. Based on the results, suggestions are offered for improving foreign students' listening and note-taking skills. (MSE)

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LECTURE COMPREHENSION AND NOTE-TAKING FOR L2 STUDENTS

by

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A paper to be presented at the
9th World Congress of Applied Linguistics
(AILA) in Thessaloniki, Greece in April, 1990.

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ABSTRACT

Most information is still conveyed to university students through lectures. This teaching method requires sophisticated listening and note-taking skills and poses additional difficulties for non-native students. To identify areas which might be amenable to improvement through teaching, a linguistic analysis of science lectures has been carried out in the Sultanate of Oman. The relationship between the lecturers' method of explaining and the way the students recorded information was investigated by means of an examination of notes on one topic. Based on the findings of the SQU study, suggestions will be offered for improving the listening and note-taking skills of overseas students. Guidelines will then be distributed for discussion.

Lectures are still the primary source of information for university students. For non-native speakers they may be the only one if their language skills are not up to reading authentic first language texts. Therefore, it is even more vital that they are able to follow their lectures and record the key points. Most NNS, however, are ill-equipped to do so. For this reason, study skills courses are becoming an integral part of the program of undergraduates at English-medium institutions. Yet, most of their material is based on intuition and very few scientific investigations have been conducted to determine the specific problem areas of NNS in comprehending lectures.

A linguistic study of forty science lectures has been undertaken at Sultan Qaboos University in the Sultanate of Oman with the aim of identifying those areas which might be amenable to improvement through teaching. The lecturers' methods of explaining were examined and related to the notes taken by their students. This paper briefly reviews research on listening and note-taking on lectures and discusses the findings of the SQU study, concluding with recommendations for EAP instructors to help upgrade the study skills of non-native university students.

Literature Review

Most research on lectures has been carried out in a native-speaker context. Beard and Hartley (1984) reviewed over fifty studies on note-taking with L1 students. In those involving questionnaires, students were asked about their reasons for taking notes. A majority claimed that writing things down in their own words helped them to remember. They also thought that their notes were useful for revision, enabling them to reconstruct the lecture at a later date.

The experimental studies showed a clear positive correlation between note-taking and the students' recall of information. However, Beard and Hartley (1984) questionned the validity of these studies due to the artificial testing environment and inadequacy of the measures employed.

Further studies examined the relationship between students' notes and test performance. For example, Norton (1981) found that students with the best test results were those who recorded complete notes, had positive attitudes towards the value of note-taking, and had made use of their notes to revise.

Overall, the L1 research suggests that: 1) note-taking can aid the learning process, 2) note-taking facilitates the recall of information, and 3) reviewing one's notes is a useful exercise (Beard and Hartley, 1984).

Bases on these investigations, tentative guidelines for improving note-taking practices for L1 students have been offered

by Beard and Hartley (1984), Brown (1979), Gibbs (1981), and Norton (1981).

In contrast, only a small number of researchers have considered the special problems of foreign students in understanding lectures given in English. Wijasuriya (1971) analyzed forty-six taped lectures in a variety of disciplines and suggested that logical connectors and discourse markers were an important but neglected aspect of "classroom" language. He recommended that these features be included in listening comprehension exercises for foreign students.

Holes (1972) investigated the English language problems of overseas postgraduate students at the University of Birmingham. He found that many students' problems were caused by their being unaware of culture-bound knowledge, by their inability to interpret either the speaker's intonation or stress, and their ignorance of colloquial expressions and changes of register. He pointed out that speech has a lower level of redundancy for the foreign listener than for the native.

At the University of Newcastle-upon-Tyne, Morrison (1974) set out to determine and rate the listening comprehension problems that overseas postgraduate students encountered in Science courses. By means of questionnaires he identified the following linguistic features (in order of difficulty):

1) the referential system (anaphora, cataphora, etc.; transition markers and logical connectors).
2) lexis (especially idiom and nominalized groups).
3) phonology.

While a few materials writers in the 1970's acknowledged these research findings, none heeded the advice of Holes (1972) and Morrison (1974) to base their study skills courses on a descriptive analysis of authentic spoken discourse (James et al. 1979, Jordan 1978, Jordan and Matthews 1978).

The 1980's saw a shift towards incorporating authentic materials in EAP courses. For example, Lebauer (1984) demonstrated how transcripts of academic lectures can be analyzed with students to improve their lecture comprehension skills. By focussing on the lecturers' use of cues or discourse markers, she claims that "students are better able to organize the incoming information as they listen because they are more aware of their role in selecting information, following the lecturer's organizational design, and making predictions about where the lecture is heading" (Lebauer 1984, p.53).

Chaudron and Richards (1986) reported on a study they conducted to investigate how different categories of discourse markers affected NNS' comprehension of academic lectures. They found that an awareness of the lecturers' signals of major segments, helped the students understand and follow the lectures, supporting Lebauer's (1984) assertions.

DeCarrico and Nattinger (1988) examined the functions of phrasal discourse markers in lectures on a variety of topics. They suggest that a greater emphasis needs to be placed on teaching these informal markers.

More recently, a few researchers have looked at the quality of lecture notes in relation to listening comprehension (Chaudron et al. 1988, Dunkel 1985, 1988). They have drawn upon L1 research to develop measures to characterize the content or organizational features of notes. While conceding that their measures are incomplete and need further refining, these studies take us a step closer to developing a functional theory of lecture-information processing.

The researchers investigating L2 note-taking skills point out that work in this area is still in its infancy. They have recommended the study of lecture structure and its influence on students' ability to record and recall information (Chaudron et al. 1988), taking into account their cultural and educational backgrounds (Dunkel 1988, 1989). To our knowledge, no studies of this nature have taken place in an EFL context, despite the increasing number of university students in need of EAP courses. Yet, for study skills courses to be effective, they must be based on a linguistic analysis of students' own lectures.

In line with these recommendations, a study of the linguistic features of lectures and an evaluation of students' notes was carried out at Sultan Qaboos University. Its aim is to provide pedagogical guidelines for EAP materials writers and instructors to develop appropriate listening and note-taking activities for their students.

The first area of inquiry has focussed on lexis and addressed the following research questions:

1) What techniques are used by the lecturers to explain and elaborate vocabulary?

2) Do the students take advantage of their lecturers' cues to select important information and organize their notes?

3) What strategies do the students employ when taking notes?

SQU Study

Background to Study

Sultan Qaboos University, Oman's first university, opened in 1986 - a major achievement since formal education did not begin in the Sultanate until 1970. The overall English language proficiency of students entering the institution is low. To upgrade their English and develop their study skills, the first two semesters are devoted to a foundation course which is comprised of 14 hours per week of English language tuition and 6 hours of Science.

Subjects

While previous studies have dealt with foreign students in Britain and North America attending lectures alongside English students, the SQU study involves native-speaker professors addressing groups of non-native students. Omani students in the Science Foundation course were given lectures by two British geologists who had no previous experience of teaching NNS.

Method

Both professors introduced Geology in a series of 50 min. lectures spanning four weeks. They presented the same material to three separate groups of twenty-five freshmen in regular classrooms. The first and last lectures of each topic were audiotaped for both lecturers and forty were transcribed, noting such prosodic features as intonation, stress, rate of speech, pause, and nonverbal features (eg. writing). This type of transcription permitted a functional analysis of the discourse of explanations.

Following Chaudron's work on vocabulary elaboration (1979, 1982, 1988) the material selected for our analysis included "all instances of the use of special terminology or expressions that the (lecturers) in some way qualified, explained, questioned, repeated, paraphrased, or expanded on" (1979, p.5).

In order to discover the most frequent means by which lecturers explained and elaborated vocabulary, it was necessary to devise a quantifiable unit of analysis which we have termed an elaboration. It consists of a base word or phrase followed by one or more reformulations.

In our coding scheme, all base words are coded as A and subsequent reformulations as B, C, and so on. The following excerpts illustrate typical elaboration patterns. The base words are indicated by a solid line and reformulations by a broken one.

i) AB Pattern: a simple elaboration with a base word followed by one reformulation:

We can see that quartz is sometimes .. completely colourless .. you can see here .. has no colour

Here is a rock which is composed entirely completely of ooliths

ii) ABC Pattern: a base word followed by two reformulations:

Some of the beds have clasts . stones or what we call pebbles

biological or organic precipitation . that is with the help of animals and plants

iii) AAB Pattern: a base word followed by a repetition and then a reformulation:

This mineral effervesces ok it effervesces ... it bubbles with HCl and that's quite a useful word

You know crystallization .. crystallization is the formation of crystals

Some examples involved up to 7 reformulations, often with other elaborations embedded, making the explanation very difficult to follow. Such instances we have termed **verbal mazes**. In the following excerpt Lecturer B attempts to explain "conglomerates" and in the process elaborates on two more terms "bonded together" and "finer sediments" and also gives an analogy far removed from the scientific context.

Conglomerates . rocks in which pebbles are rounded . and they're bonded together held together. by finer sediments or by cement the - same word as for cement that we use for building . uh it just means sticking together.. so a variety of different minerals . can act to hold together . there are- some of this is cemented by iron compounds .. so conglomerate roundy rounded pebbles . held together . all all conglomerate means is a bringing together . uh . you can also have - if you have a number of companies in business . that join together . then they are also called a conglomerate .

so conglomerate just means . many different things together (Lecturer B).

For each elaboration a check-list was devised to record information about such features as:

1) type and complexity of pattern

2) discourse markers

3) speed and stress

4) overt signals of importance

5) type of explanation

6) technicality of terms used.

The data were then analyzed by computer using the Statistical Package for the Social Sciences (SPSSX). Frequency counts and cross-tabulations of variables were performed to determine significant associations.

Summary of Results

The most frequently used type of elaboration was the simple AB pattern, with a base word followed by one reformulation. At first glance this would seem to facilitate comprehension. However, ambiguities can occur with co-ordination and apposition, where students may have difficulties distinguishing between new information and alternative terms. For instance, in the following example, it may not have been clear that the lecturer was using two terms for the same thing.

Detrital or clastic sediments are produced by physical sedimentation

For NNS who have not been alerted to the use of grammatical parallelism in elaborations, synonyms may be decoded as additional items of information as in:

The mineral has a vitreous glassy lustre

The second most common pattern in the corpus was the verbal maze with its complex arrangement of elaborations. Assigning the proper connections between the elements and retaining this information all the way through the verbal maze is an impossible challenge for many overseas students.

Most elaborations did not begin with any consistent change of volume or rate of speech, so students would likely not be alerted that important information was to follow, resulting in incomplete notes.

Of special interest to EAP instructors is the fact that stylistic differences between the lecturers were found in almost all the areas examined, including: the amount and variety of vocabulary, the number of technical terms and definitions, and the use of discourse markers and explicit signals of importance. Such stylistic variations underline the need for context-specific studies.

In summary, this linguistic analysis has revealed many aspects of lecturing which could pose barriers to successful comprehension and note-taking by non-native students. (For the complete analysis see Fahmy and Bilton, 1989a).

Students' Notes

Method

The relationship between the lecturers' methods of explaining and the ways the students recorded information was investigated by means of a detailed examination of notes on one topic. "Sedimentary Rocks" was selected as it was the only one that spanned two class periods and therefore provided more material for analysis. All of the base words were listed and in the case of inverted definitions, the word defined was used. The ones employed in both the first and last lectures were noted for each lecturer. These short lists of base words were thought to represent the key terms on Sedimentary Rocks as the lecturer felt it necessary to explain them on both occasions. They were checked against an outline reconstructed from the lecture transcript and were found to include all the headings and subheadings of the lecture. This list was then used to provide a measure of the completeness and accuracy of the Ss' notes. In addition, the notes were examined for organization (hierarchy, sub-headings, numbering), clarity and succinctness.

Results

In "Sedimentary Rocks" (Parts I & II), 186 base words were used by Lecturer A and 232 by his colleague. A listing of the key terms (Parts I & II) showed that a mere 10.0% of all of these basewords were repeated in their parallel lectures.

Most of Lecturer A's key words and two-thirds of Lecturer B's were written on the board or referred to in the Ss' handout.

Lecturer A verbally signalled the importance of two-fifths of his terms, while his colleague did so in only a few cases. An interesting observation was the fact that key words were explicitly signalled much more frequently than were the base words that occurred in only one of the sessions, thus reinforcing the fact that the lecturers considered them important.

All of Lecturer A's and almost all of Lecturer B's terms were technical or semi-technical. This supports the earlier findings that the non-technical vocabulary played a subordinate role in the lectures, occurring as spontaneous discourse, whereas technical vocabulary formed part of the syllabus.

(a) Handouts

An examination of the Ss' notes revealed that 63.8% made independent notes in English, while 36.2% simply wrote on their handouts. Of these, 17.2% used English and Arabic, 12.1% Arabic, and 6.9% English only. On the handouts, the majority of annotations were simply glosses of individual words and in most cases no attempt was made to add information such as examples detailed by the lecturer (Fig. 1). Whereas some students recorded the lecturers' reformulations, others wrote down what they thought the Arabic equivalent was. These students did not make full use of the lecture to improve their level of English and may also have mistranslated, resulting in an inaccurate record. In a few instances, some even placed the elaboration next to the wrong base word.

On their handouts, Lecturer A's students recorded 16.1% of the explanations of the key base words, whereas a mere 2.9% were noted by Lecturer B's. It is possible that since Lecturer A verbally signalled the importance of many of the terms, his students recorded more of them.

Although there was some evidence of appropriate underlining, numbering, and highlighting in 62% of cases where students relied exclusively on handouts for their record, in no instances was it complete. Many annotations showed that students were processing the aural information at a low level and trying to translate every word, as shown in the following example (Fig. 2). The indiscriminate circling and underlining of words and phrases demonstrates an inability to distinguish main points from supporting details. Only one-fifth of the students copied down diagrams or illustrations to supplement the text; but partly due to lack of space and poor copying skills, these illustrations were inadequate. Moreover, some of the students' annotation was so illegible and unorderly (Fig.3) that it would hinder review of the lecture and leave them unprepared for examinations, especially considering that for them the handout was their sole source of information. Some merely scribbled and doodled on the back of their handouts (Fig. 4).

(b) Independent Notes

When students took independent notes in English, it was found that, on average, they elaborated on far more key base words than did those who restricted themselves to handouts alone.

Lecturer A's Ss recorded half and Lecturer B's just under one-third of the elaborations. Furthermore, almost all students amplified their independent notes with examples and illustrations; hence, they had a fuller record of the lectures (Fig. 5). A few students were able to copy diagram correctly but many omitted or misspelled labels (Fig. 6).

While three-quarters of the notes were accurate, 20% of them contained inaccuracies, mispellings that interfered with communication, or unfinished phrases, where the Ss had been unable to get down the full explanation (Fig. 7).

Most of the Ss' notes were neat and legible and just over half showed some organization. These students used headings, subheadings, and numbering to some degree and a few actually highlighted or underlined key points as in Fig. 8. However, only one example of an abbreviation was found in the entire body of data and up to one third of the students' notes included superfluous information (Fig. 9). A quarter of the students made notes that were very disorganized. Fig. 10, for example, shows no indentation, confused numbering with a mixture of Arabic and English, poor spacing, and also an inconsistent use of underlining. Other students were very untidy. Try following these (Fig. 11).

Summary

In summary, our analyses of both handouts and independent notes revealed that many students were not aware of the cues

given by the lecturer to signal his key base words and had difficulty extracting them from the ongoing discourse. A few attempted to write down everything said. When students did try to record important points, they made no use of standard abbreviations or any form of shorthand and, thus, had difficulty limiting themselves to information-carrying words. In almost half of the cases where independent notes were made, layout was poor and relationships between items of information were not clearly indicated. As a result, students were left with an incomplete and misleading summary of the lecture.

Based on the findings of this study, some suggestions are made to promote more effective techniques of note-taking.

Suggestions to improve Listening and Note-Taking Skills of NNS

1. Materials for the Study Skills course should, whenever possible, be based on EAP instructors' observations of their students' lectures. Features of the lecturer's delivery could be noted using a small number of items from a checklist which should include the lecturer's use of:

- logical connectors (eg. "but", "so", "and", etc.)
- discourse markers of frames (eg. "right", "now", "ok", speed and stress)
- signals of importance (verbal and non-verbal)
- techniques of defining and explaining

2. Students can be encouraged to recognize and take advantage of their lecturer's cues. For example an awareness of his signals of

importance will alert students to the necessity of recording information and should result in more complete notes.

3. Students should be advised to eliminate from their notes such phrases as "There are many different kinds of", "in other words", and "..is defined as" so that they restrict themselves to information-carrying words. They should practice the removal of redundant items such as articles, the verb "to be", modal verbs, and unnecessary repetitions.

4. A list of standard abbreviations and symbols should be provided along with suggestions on how to devise one's own.

5. Students should be told:

a) when it is appropriate to interrupt a lecture
b) how to ask questions politely with correct intonation and stress
c) how to make requests (eg. "Please would you speak more slowly")
d) how to seek clarification when the lecturer uses anecdotes or elaborations and to ask whether the information is additional or alternative.

6. The advantages of taking independent notes and annotating their handouts in English should be stressed.

7. Extensive practice should be given in copying texts and diagrams from the board or OHTs.

8. The Study Skills course should start with guided notes, where

possible based on the observed lectures, and gradually reduce the amount of support.

9. When making independent notes, Ss should be encouraged to use a wide margin and to leave plenty of space between their jottings during the lecture so that, if necessary, inserts can be made.

10. Students need to be shown how to organize these jottings so that the relationships of the various points of the lecture are clear. For example, instruction should be given in the use of underlining, numbering of points, subheadings and indentations so that after the lecture they are able to reconstruct the lecture in the form of an outline. Ss should be shown how to take advantage of arrows, decision trees, Venn diagrams, and flow charts to organize the information they extract from their notes.

11. A very useful classroom activity is proposed by Gibbs (1981). After a lecture, students, in pairs, examine each others' notes with a view to finding out what strategies were employed. Then, in small groups, each student explains his/her partner's notes and the groups consider the characteristics of all notes, selecting those which are the most useful. This activity is intended to foster their awareness of the process of note-taking.

12. Students could use their notes to replay part of a lecture in

small groups. This activity should draw their attention to the need for complete and well-organized notes.

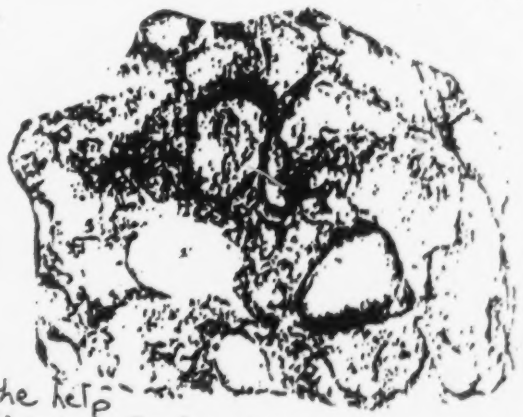
13. Ideally, all listening comprehension and note-taking material for EAP courses should be based on analyses of authentic spoken discourse. If possible, students' lectures should be audio- or videotaped. A transciption of 10 or 15 minutes of a lecture can provide sufficient exercises for a study skills unit, which might include pre-listening activities and exercises to train students to listen for signals of lecture structure and important information, sorting examples from general statements, and working out the meanings of words in context, as well as giving practice in outlining. See, for example, Fahmy and Bilton, 1989b.

Figure 1 : Glossing

Sedimentation is the final stage of a process that begins with erosion and transportation of eroded materials to places of deposition. Physical sedimentation is the deposition of such material in the lowest places to which air and water currents can transport them. Chemical sedimentation is mainly the process by which sea water keeps a constant composition by depositing sediments to balance the dissolved weathering products brought into sea by rivers. (Calcium carbonate is an example.)

Sediments are classified into two main groups:

1. Detrital or clastic sediments: made by the accumulation of particles of minerals or rocks represented by pebbly rocks, sand and clays.



Conglomerate

2. Chemical - organic sediments: formed by deposition of material from solutions such as limestone and salts or by organic processes such as coal.

Figure 2: Indiscriminate Circling

Carbonaceous rocks (Coal and bitumens) Flint-, Chert Jasper

The coals are bedded carbonaceous rocks formed from accumulations of plant debris. The effect of chemical and bacterial actions at the surface, followed by compression due to burial under younger material, convert a layer of loose vegetable matter into a compact coal seam. Each stage in the process of change is represented by a different-looking rock, the products of the entire sequence of changes being known as the coal series; the position of a given rock in the coal series determines its rank. The improvement of rank from beat through to anthracite is marked the increase in denaity, hardness and carbon content any by decrease in content of moisture and volatile substance. Generally the higher the rank the more valuable the coal as fuel. Coal seems can be seen in a red/purple shales along a recent road cutting at Al-Khod west of the University campus.

Qaa Series

Rock Salt and Rock Gypsum

In the geological past many areas that are now dry were covered by shallow areas of the sea that had only narrow connections with the open ocean. Under these conditions, water continually moved into these areas to replace water lost by evaporation. Finally, the water of these areas became saturated and salt deposition began. Such deposits are called evaporites. Minerals commonly precipitated in this way include sodium chloride (halite) the chief component of rock salt and hydrous calcium salfate (gypsum) which is the main ingredient of rock gypsum.

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Figure 3

SEDIMENTARY ROCKS

Sedimentation is the final stage of a process that begins with erosion and transportation of eroded materials to places of deposition. Physical sedimentation is the deposition of such material in the lowest places to which air and water currents can transport them. Chemical sedimentation is mainly the process by which sea water keeps a constant composition by depositing sediments to balance the dissolved weathering products brought into sea by rivers. Calcium carbonate is an example.

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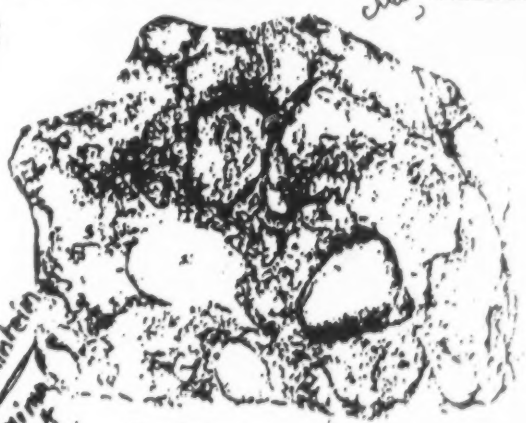


Conglomerate

2. Chemical - organic sediments: formed by deposition of material from solutions such as limestone and salts or by organic processes such as coal.

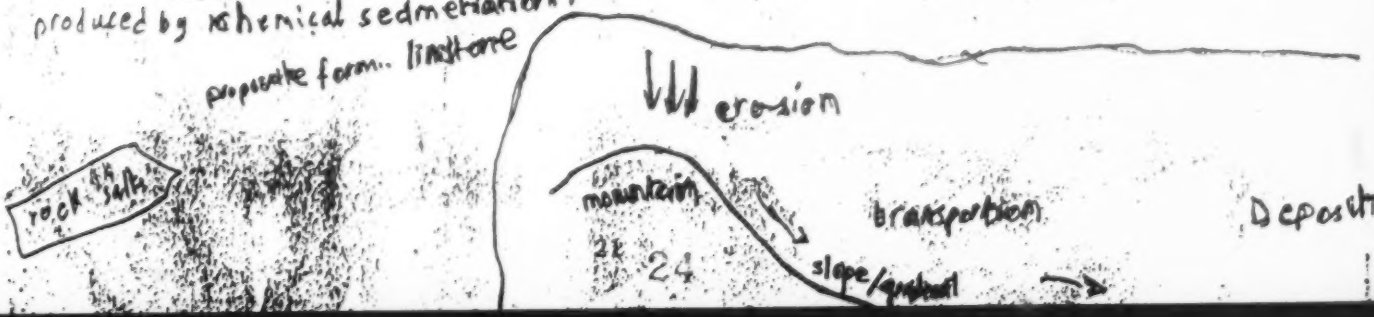


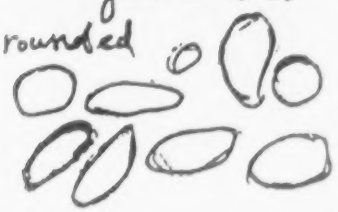
Figure 4: Scribbling

limestone: #Organic limestone: ① Shelly limestone: accumulation of shell fragment calcium carbonat (matrix deposited with shells . cement at a later date.)
② Coral limestone: marine organic - corals - skeletal framework remains
③ chalk: very pure limestone (calcium carbonate) → minute skeleton of algea

Figure 5a: Illustrations

Types of clastic sediments

1) pebbly sediments gravel n. cemented
(coarse sediments) Ss



conglomerates → Breccias

rounded

sand
soft

s.r
cement
Sandstone
hard

2) sandy sediments
produced by physical sedimentation

fine grains

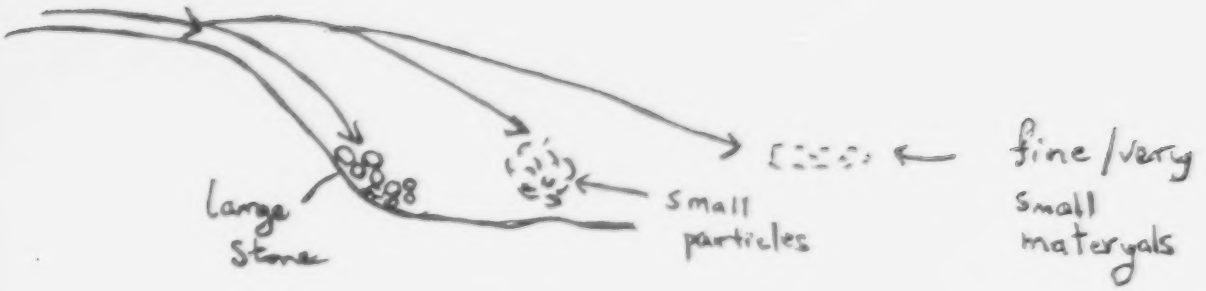
3) Clayey sediments
muds, clays
new minerals

Ranges of sizes of sediments → Name

Figure 5b: Illustrations

○ Sedimentation – Settling out –

– Settling by flow



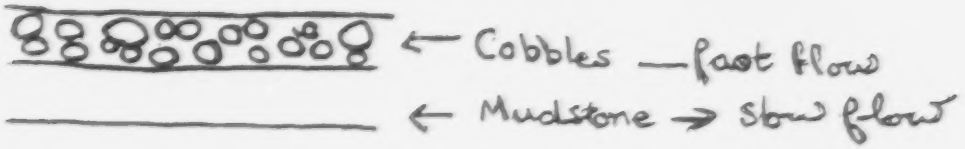


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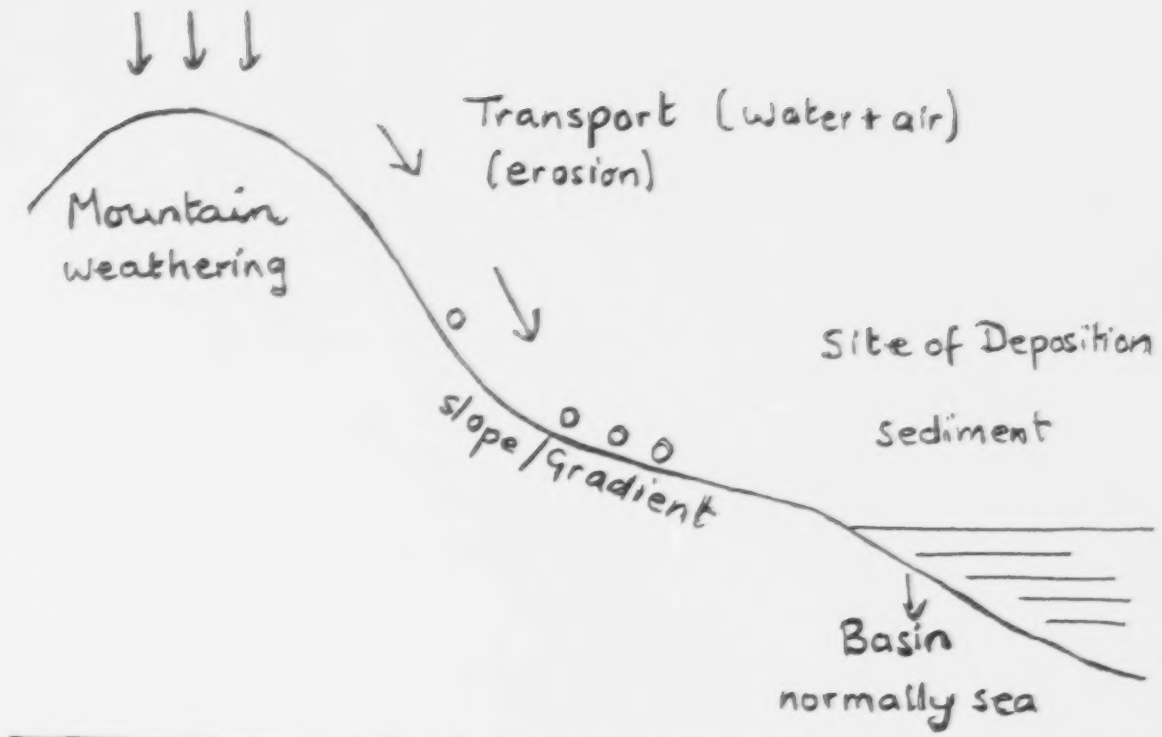
Figure 6: Diagrams

(a)



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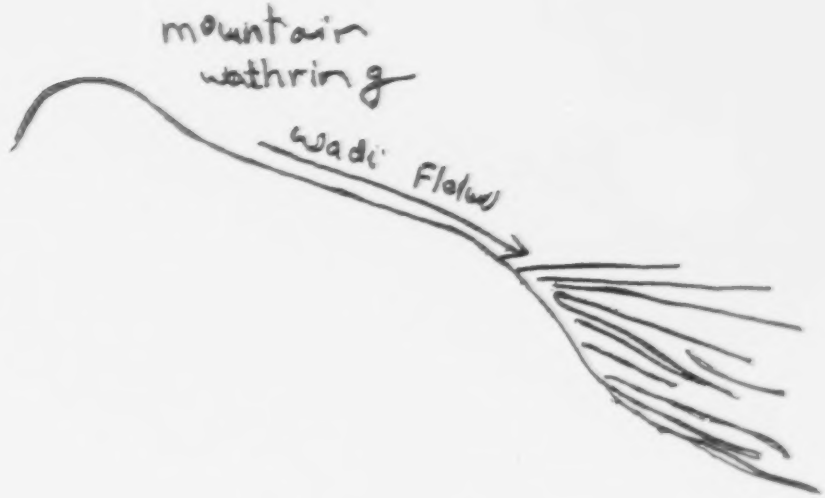
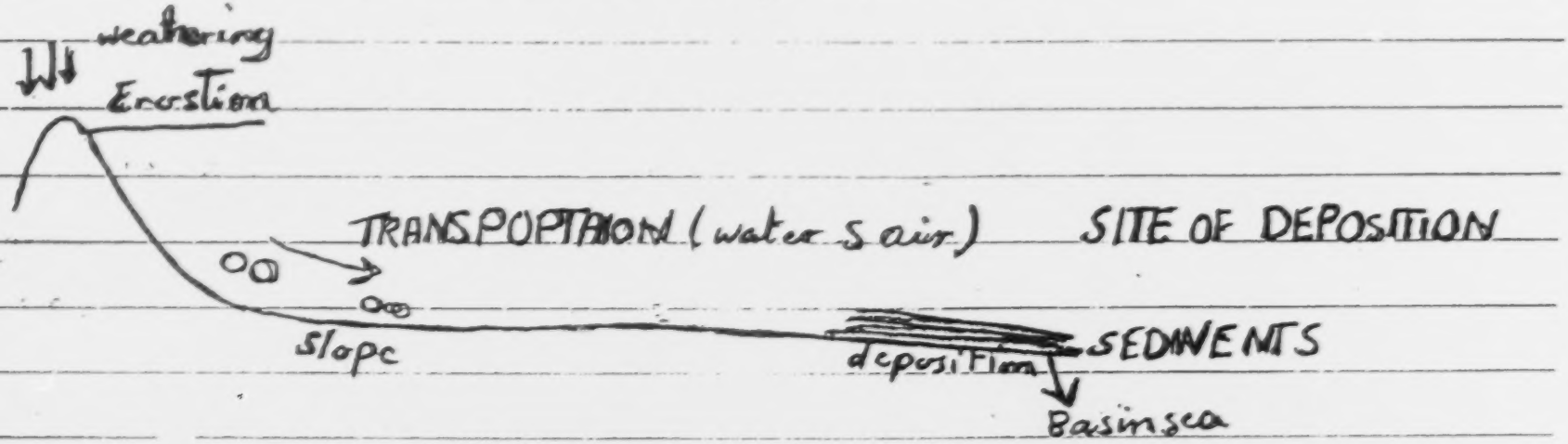


بسم الله الرحمن الرحيم

SEDIMENTARY



Physical sedimentary: some thing to move from the .

Figure 7: Misspelling and Poor Labelling

Figure 8: Indentation and Ordering

(A) Clastic or detrital rocks:-

1. Conglomerates.
2. Sandstone.
3. Breccia.
4. Clayey or pelitic rocks e.g. shale.

(B) Chemical and organic limestone:-

- limestones: are made largely of Calcium carbonate ($CaCO_3$) ↔ Calcite.

It is the most abandant Sedimentary rock making up 10% by volume world wide. Ther are many different types.

$$Ca^{+2} + HCO_3^- \longrightarrow CaCO_3 + H^+$$

The reacation may be biochemical (organically) or may occur inorganically.

1. Shelly limestone consists of calcitic shells of former marine organisms. That are cemented together.
2. Chalk also consists of sea shells that are very tiny (called foraminifera).

Figure 9: Superfluous Words

Carbonate rock.

These are made from organic material.
Coal comes from swamp vegetation. ~~but it also~~
A swamp is like a very shallow lake
but also has vegetation growing in it.
If you think of soil with ~~soil~~ vegetation.

Classification of sedimentary rocks.

(1) Criterion
first criterion is size.
1. Pebbly rocks

Second criterion is conglomerates (shape)
round or angular

Third criterion is mineralogy.

(2) Sandstone - shelly

(3) Fine-grained sedimentary rocks
shales
mudstone

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Figure 10: No Indentation

① Organically — Type of limestones:

① Shelly limestone fossil shells held together by a calcite cement.

② chalk: shells of very tiny creatures

③ Coral limestone: skeletones from former coral reefs.

④ Oolite: non-organic sphere made of many $CaCO_3$ coverings formed in shallow water

c (b) chemical precipitates e.g halite (NaCl)
formed from evaporation of water from salt lakes

(c) carbonaceous rocks
e.g Coal (swamp vegetation) from ancient swamp veg: there are many types
(p. 85's table of different types)

4 (d) Silicates

Figure 11

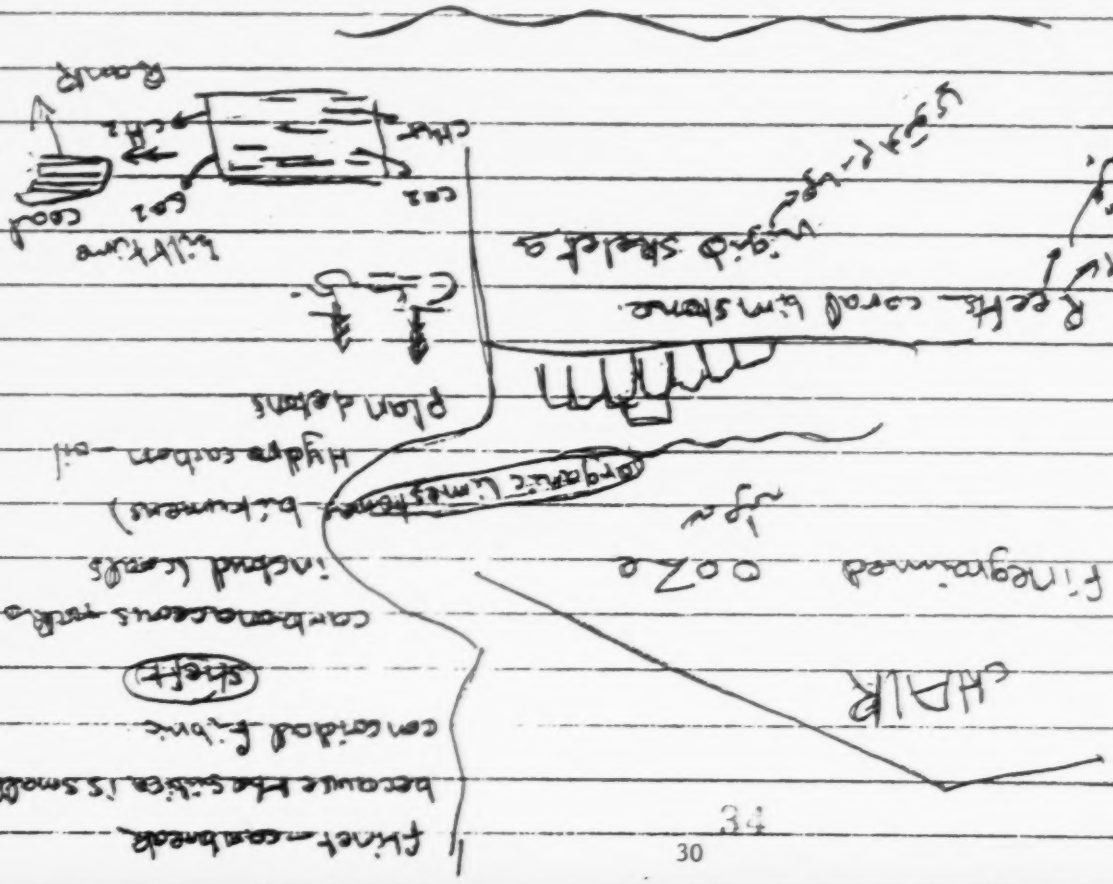
2. sandy stones - smaller clasts - soft ~~#~~ > 2mm
sediment → sedimentary (hard rock)

3. silty: ~~silty~~ soft

4. clayey: pelitic

eg! mud = contains a lot water squese the mud 27% water
2. clay: not much water < 7% water scaly
3. mudstone: contain amount (much) mud
4 shell contain waters.

Fabric called fissite
aligned
last more water compressied so much
that is then a fabric



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